



# Grade 11/12

Below are the Connecticut Standards of Learning in Math, Technology, Social Studies, and Science and arranged by competency area and Grade. The Standards are checked (✓) to identify the extent to which TRAC PAC 2 modules relate to the Connecticut Standards.

<i>Design &amp; Construction</i>	<i>Environmental</i>	<i>Maglev</i>	<i>Motion</i>	<i>Highway Safety</i>	<i>SunCity</i>	<i>Traffic Technology</i>	<i>GPS 101</i>	<i>Cantilever Beam</i>	<i>Jeopardy</i>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Compare and contrast ways of financing an enterprise.





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Bridge Builder	Design & Construction	Environmental	Maglev	Motion	Highway Safety	SunCity	Traffic Technology	GPS 101	Cantilever Beam	Jeopardy
✓			✓							

Define and use the quality control measures of pre-inventory inspection, statistical; process control and total quality management.  
 Discuss the required modifications if a product were to be manufactured in a nontraditional environment.  
 Calculate the cost of producing a manufactured product and determine a retail price.  
 Develop a marketing plan and successfully distribute a product.

**TECH ED - Grades 9-12 - Engineering Design**

Students will be able to apply the engineering design process to achieve desired outcomes across all technology content areas.

✓	✓	✓	✓	✓				✓	✓	
✓	✓	✓	✓	✓				✓	✓	
✓	✓	✓	✓	✓				✓	✓	
✓	✓	✓	✓	✓				✓		
✓	✓	✓	✓	✓				✓		

Differentiate between the problem solving and engineering design processes.  
 Describe the detail design phase of the engineering design process.  
 Demonstrate an ability to complete a detail design for any given embodiment design.  
 Apply a variety of creativity-enhancing techniques in completing a conceptual, embodiment, and detail design solution.  
 Apply the full engineering design process to produce a product on time that meets all initial criteria, using appropriate tools and material resources.



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## SOCIAL STUDIES - Grades 9-12 - Physical System

Students will use spatial perspective to explain the physical processes that shape the Earth's surface and its ecosystems

		✓			✓						Analyze the distribution of ecosystems by interpreting relationships between soil and climate, and plant and animal life.
		✓			✓						Evaluate ecosystems in terms of biodiversity and productivity and show how they are dynamic and interactive; and
		✓			✓						Use geographic tools to represent and interpret Earth's physical and human systems.

## SOCIAL STUDIES - Grades 9-12 - Human Systems

Students will interpret spatial patterns of human migration, economic activities and political units in Connecticut, the nation and the world.

					✓						Explain and analyze how various populations and economic elements interact and influence the spatial patterns of settlement.
					✓						Explain and analyze the causes of change in the political, social and economic division of the Earth's surface at different scales.
					✓						Use geographic tools to represent and interpret Earth's physical and human systems; and
					✓						Draw a freehand map demonstrating political, cultural or economic relationships.

## SOCIAL STUDIES - Grades 9-12 - Human and Environmental Interaction

Students will use geographic tools and technology to explain the interactions of humans and the larger environment, and the evolving consequences of those interactions.

		✓			✓						Use maps, globes, charts and databases to analyze and suggest solutions to real-world problems.
		✓			✓						Create appropriate maps and other tools to solve, illustrate or answer geographic problems; and
		✓			✓						Apply concepts of ecosystems to understand and solve environmental problems.

## SOCIAL STUDIES - Grades 9-12 - Limited Resources

Students will demonstrate that because human, natural and capital resources are limited, individuals, households, businesses and governments must make choices.

✓	✓	✓	✓	✓	✓	✓	✓	✓			Analyze the impact of economic choices on the allocation of scarce resources.
✓	✓	✓	✓	✓	✓	✓	✓	✓			Define, defend and predict how the use of specific resources may impact the future; and
✓	✓	✓	✓	✓	✓	✓	✓	✓			Analyze how technological change can affect long-range productivity.

## SOCIAL STUDIES - Grades 9-12 - Economic Systems

Students will demonstrate that various economic systems coexist, and that economic decisions are made by individuals and/or governments, influenced by markets, cultural traditions, individuals and governments in the allocation of goods and services.

					✓						Evaluate economic systems by their ability to achieve broad societal goals, such as efficiency, equity, security, employment, stability and economic growth.
					✓						Interpret important statistics about the national economy: the inflation rate, unemployment rate, Gross Domestic Product and its growth rate.
		✓			✓						Analyze the impact of government taxing and spending actions and changes in the money supply and interest rates on the national economy.
					✓						Explain reasons for government action in the economy, including providing public goods and services, maintaining competition, redistributing income, promoting employment, stabilizing prices and sustaining reasonable rates of economic growth; and
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Analyze the impact of specific government actions in the economy on different groups, including consumers, employees and businesses.

## SOCIAL STUDIES - Grades 9-12 - Economic Interdependence

Students will demonstrate how the exchange of goods and services by individuals, groups and nations, creates economic interdependence and how trade results in change.

											Evaluate the effects of national policies (e.g., on trade, immigration and foreign investments, as well as fiscal and monetary policies) on the international exchange of goods, services and investments.
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## SCIENCE - Grades 9-12 - Motion and Forces

Newton's laws predict the motion of most objects

			✓	✓	✓			✓			When forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest.
			✓	✓	✓			✓			The law $F = ma$ is used to solve motion problems that involve constant forces.
			✓	✓	✓			✓			When one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction.
			✓	✓	✓			✓			Applying a force to an object perpendicular to the direction of its motion causes the object to change direction.
			✓	✓	✓			✓			Circular motion requires the application of a constant force directed toward the center of the circle.
			✓	✓	✓			✓			Newton's laws are not exact but provide very good approximations unless an object is small enough that quantum effects become important.

## SCIENCE - Grades 9-12 - Conservation of Energy and Momentum

The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects

			✓	✓	✓			✓			Kinetic energy can be calculated by using the formula $E = (1/2)mv^2$ .
			✓	✓	✓			✓			Changes in gravitational potential energy near Earth can be calculated by using the formula (change in potential energy) = $mgh$ .
			✓	✓	✓			✓			Momentum is calculated as the product $mv$ .
			✓	✓	✓			✓			Momentum is a separately conserved quantity different from energy.
			✓	✓	✓			✓			An unbalanced force on an object produces a change in its momentum.
			✓	✓	✓			✓			The principles of conservation of momentum and energy can be used to solve problems involving elastic and inelastic collisions.

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## SCIENCE - Grades 9-12 - Heat and Thermodynamics

Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat											
			✓	✓	✓						Heat flow and work are two forms of energy transfer between systems.
			✓	✓	✓						The work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature.
			✓	✓	✓						The internal energy of an object includes the energy of random motion of the object's atoms and molecules . The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.
			✓	✓	✓						Most processes tend to decrease the order of a system over time, so that energy levels are eventually distributed more uniformly.

## SCIENCE - Grades 9-12 - Waves

Waves have characteristic properties that do not depend on the type of wave											
											Waves carry energy from one place to another.
											Transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the earth as seismic waves.
											Wavelength, frequency, and wave speed are related.
											Sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.
											Radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is approximately $3 \times 10^8$ m/s, and less when passing through other media.
											Waves have characteristic behaviors such as interference, diffraction, refraction and polarization.
											Beats and the Doppler Effect result from the characteristic behavior of waves.

## SCIENCE - Grades 9-12 - Electric and Magnetic Phenomena

Electric and magnetic phenomena are related and have many practical applications.											
			✓					✓			The voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors, and capacitors can be predicted using Ohm's law.
			✓					✓			Any resistive element in a DC circuit dissipates energy, which heats the resistor.
			✓					✓			The power in any resistive circuit element can be calculated by using the formula $Power = I^2 R$ .
			✓					✓			Charged particles are sources of electric fields and are subject to the forces of the electric fields from other charges.
			✓					✓			Magnetic materials and electric currents are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.
			✓					✓			Changing magnetic fields produce electric fields, thereby inducing currents in nearby conductors.

